Use case for Runecast @ DLR GSOC
1. Jun 2017

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Mission Operations
Communicatons and Ground Stations

Overview

Overview DLR / GSOC / spaceflight missions

IT environment

Our Challenges

Virtualization challenges and timeline

Reason for Runecast

Issues addressed by Runecast

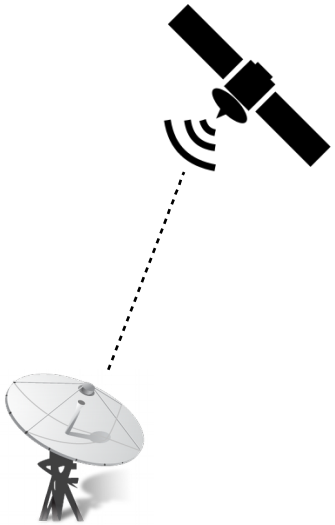
Background

Michael Szczuka
Senior Technical Engineer at DLR since 2010
Former employment in various technical and consulting positions

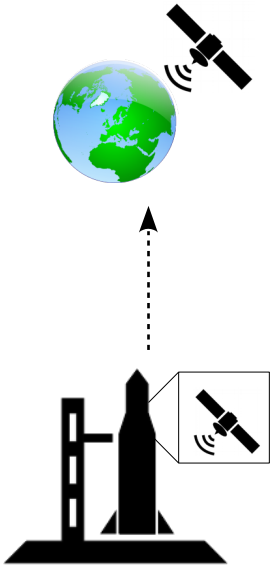
The German Aerospace Center (DLR) is the national aeronautics and space research centre of the Federal Republic of Germany.

The German Space Operations Center (GSOC) is hosted at DLR in Oberpfaffenhofen and hosts control rooms for satellite missions and manned spaceflight.

Main responsbilities of GSOC



24/7/365 operation of satellite missions



Satellite launches and LEOP

Control center for Columbus module at the Internation Space Station ISS

All images from Wikimedia Commons

DLR

Partial list of current and upcoming projects

Satellite missions

- **GRACE** (Gravity Recovery And Climate Experiment)
- **TerraSAR-X** / **TanDEM-X** (Earth observation with SAR)
- **TET** (Technology Demonstration)
- **FireBird** (monitoring of high temperature events on Earth)
- **EDRS** (European Data Relay System)
- **Eu:CROPIS** (observation of crop growth in closed loop system in space)
- **EnMAP** (Environmental Mapping Program)

Human spaceflight

- **Columbus** (European research laboratory at International Space Station)

Ref.: http://www.dlr.de/rb/en/desktopdefault.aspx/tabid-2731/

IT environment

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2012 – now
Start of virtualization for project-critical systems

2017
80 ESXi hosts
>1000 VMs
>97% virtualized

Challenges - IT and mission requirements

Very long project lifetimes
multiple year design phase +
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main focus for IT systems
prolonged failures can lead to critical events

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No central storage
data availability and redudancy achieved by OS clustering tools
but hard to migrate VMs w/o downtime

Virtualization challenges

Virtualization „step-by-step“
+ smaller work packages due to network segmentation
– long timeframe
→ **VMware version zoo**
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– hard to get system downtime
– lot of persuasion required esp. for critical systems
– „But it works – why change it?“
– „Can you guarantee that …“

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System obsolescence
+ virtual systems are easier to support for longer timeframes
– virtual systems will be used even longer without adressing necessary updates

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Runecast

October 2015:	First contact at VMworld Europe 2015
November – December 2015:	Trial @ GSOC
Since January 2016:	Runecast in production use @ GSOC

Runecast – addressing issues

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documented proof of potential and active issues
- prevent potential PSOD
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Identify configuration issues
- NTP configuration on ESXi
- forgotten snapshots

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Early information about new KB issues
new RC update may show new VMware bugs
easier than manually sifting through the KB

Demo

Summary

Runecast helped us in addressing the following main issues:

- reducing the „vSphere version zoo“ to minimize critical issues
- identifying configuration issues that are easy to overlook (NTP configuration, legacy NICs in VMs, old snapshots, …)
- constant update about state of virtual infrastructure regarding new KB issues or problems

Thank you!

Questions?

Backup

Virtualization start with ESXi 3.5
Current versions in use 5.5 U3+ and 6.0 / 6.5

Runecast initial version 1.0.0.11
Runecast current version 1.5.3.0

Backup

DLR facts

- ~8000 employees at 20 locations ins Germany
- Oberpfaffenhofen: 1700 employees, 13 institutes and facilities
- Space Operations: OP and Cologne
- Communication and Ground Station: 42 OP + 30 WHM
- DLR's mission comprises the exploration of Earth and the Solar System and research for protecting the environment

Backup: Responsbilities of GSOC

- 24/7/365 operation of satellite missions
- Satellite launches and LEOPs (Lauch and Early Orbit Phase)
- Commanding and monitoring of satellites through antenna network
- Control Center for European research module Columbus at International Space Station
- Provide IT infrastructure and services in support of satellite and manned spaceflight missions

- Internal IT department with responsibilty for network and server infrastructure of 10 people (split 5-5 between network and server)